R. SHIPMAN.

CARBURETER.

APPLICATION FILED MAR. 19, 1915. RENEWED JUNE 20, 1917.

1,254,735.

Patented Jan. 29, 1918.

2 SHEETS—SHEET 1.

Fig. 1.

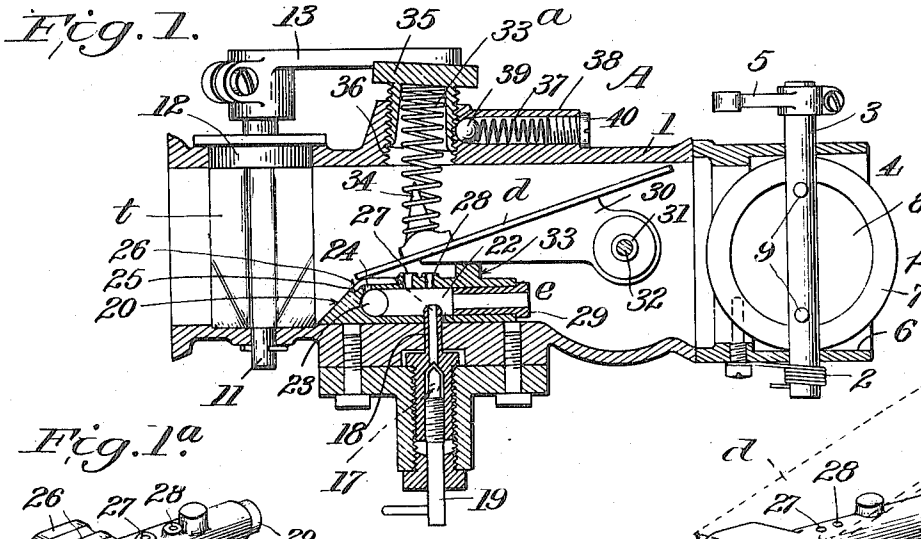
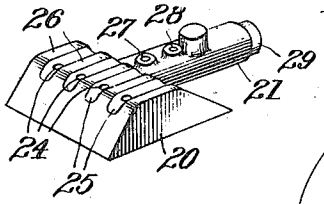


Fig. 1a.



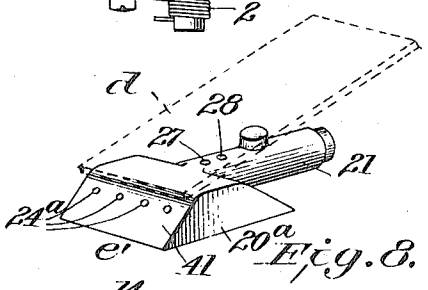


Fig. 8.

Fig. 2.

Fig. 3.

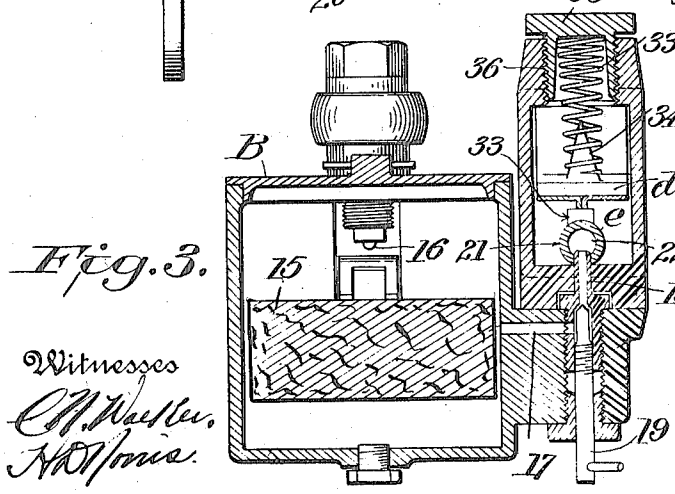


Fig. 9.

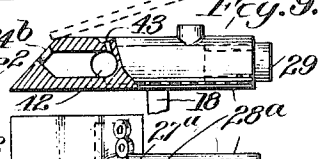


Fig. 10.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 4.

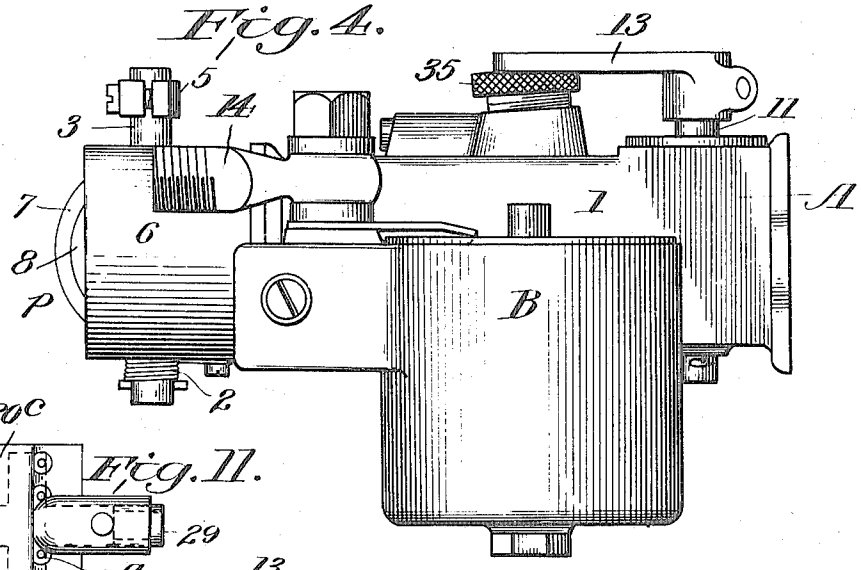


Fig. 11.

Fig. 5.

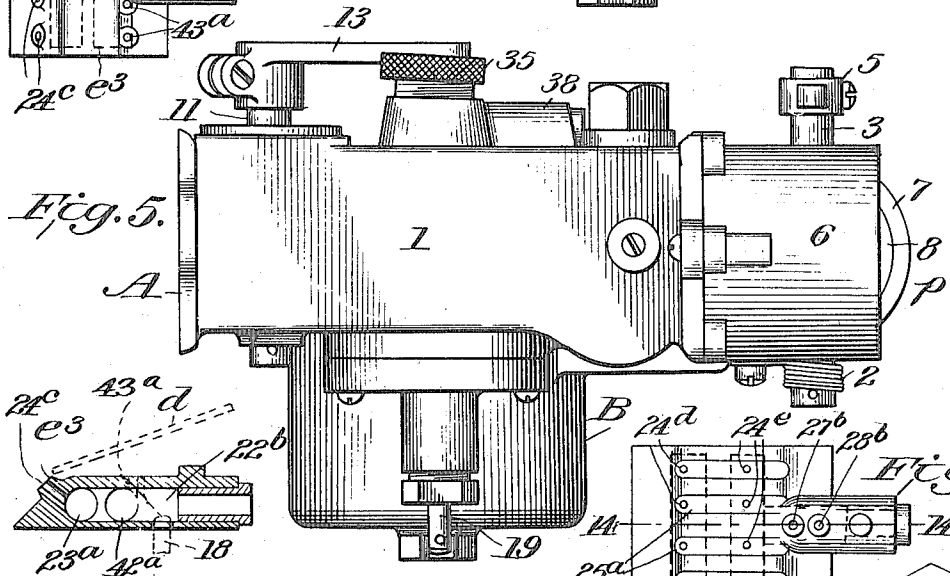
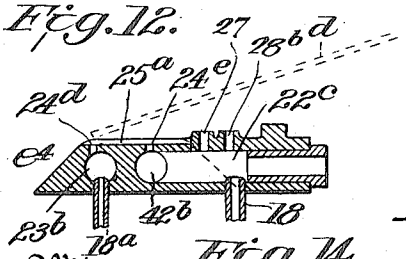


Fig. 12.



Witnesses

C. M. Dodson.

H. B. Jones

Fig. 14.

Fig. 13.

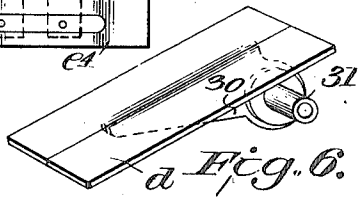


Fig. 6.

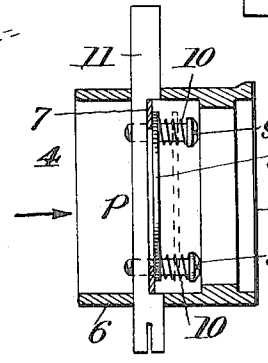


Fig. 7.

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UNITED STATES PATENT OFFICE.

RALPH SHIPMAN, OF SUNBURY, PENNSYLVANIA.

CARBURETER.

1,254,735. Specification of Letters Patent. Patented Jan. 29, 1918.

Application filed March 19, 1915, Serial No. 15,484. Renewed June 20, 1917. Serial No. 175,977.

To all whom it may concern:

Be it known that I, RALPH SHIPMAN, a citizen of the United States, residing at Sunbury, in the county of Northumberland and State of Pennsylvania, have invented certain new and useful Improvements in Carbureters for Explosive-Engines, of which the following is a specification.

The present invention relates to improvements in carbureters adapted for modern internal combustion engines, such as are used on automobiles, where the speed of the engine is not always maintained the same, but is varied at the will of the operator, and the main purpose of the invention is to provide for automatically maintaining the air and liquid fuel composing the explosive mixture in proper proportions at all engine speeds.

In the drawing accompanying this application, I have shown a carbureter of the type illustrated in my prior Patent No. 783,902, in which a hinged valve or damper, normally restricts the flow of air through the carbureter and, at low engine speeds, carries the reduced volume of air close to the liquid fuel nozzle. In passing through the restricted opening the velocity of the air is sufficient to cause a proper flow of liquid fuel, to form a suitable mixture, while, as the engine speed increases, the valve opens and a greater volume of air flows past the fuel nozzle at a speed which causes the liquid fuel to pass out in greater volume, but in proper proportion to the air to make a suitable mixture for the engine at the higher speeds. The present invention relates particularly to improvements in the spraying devices for carbureters of this type, whereby better mixtures are obtained at the various engine speeds, the draft controlled valve or damper coöperating with the spraying device to this end. The invention also comprises an improved priming valve for the carbureter, the details and advantages of which will hereinafter be pointed out.

In the accompanying drawing, which illustrates the invention,

Figure 1 is a section through the carbureter on the line 1—1 of Fig. 2;

Fig. 1ª is a perspective view of the spraying device illustrated in Fig. 1;

Fig. 2 is a top plan view of the carbureter;

Fig. 3 is a section on the line 3—3 of Fig. 2;

Figs. 4 and 5 are, respectively, opposite side elevations of the carbureter;

Fig. 6 is a perspective view of the draft controlled damper;

Fig. 7 is a section through the air intake end of the carbureter, showing the priming valve closed, and illustrating its operation;

Fig. 8 is a perspective view of a modified form of spraying device, with the draft controlled damper shown in dotted lines;

Fig. 9 is a side view, partly in section on the line 9—9 of Fig. 10, of another modification of the spraying device;

Fig. 10 is a top plan view of the spraying device shown in Fig. 9;

Fig. 11 is a top plan view of another modification of the spraying device;

Fig. 12 is a central section through the device shown in Fig. 11;

Fig. 13 is a top plan view of still another modification of the spraying device; and,

Fig. 14 is a section on the line 14—14 of Fig. 13.

Referring to Figs. 1 to 7, inclusive, of the drawing, A indicates the mixing chamber of the carbureter comprising a tubular casing 1, having at one end a priming valve *p*, and at the opposite end a throttle valve *t*, and between these valves is a draft controlled valve or damper *d*. The priming valve, as usual, is held normally open by a spring 2, upon its stem 3, in order that air may pass freely through the air intake end 4 of the carbureter, and an arm 5 is provided upon the stem to which the usual priming wire or rod may be attached for closing the valve to start the engine, when desired. For convenience in machining the parts, the priming valve is mounted in a fitting 6, which forms an extension of the casing 1. The valve, as shown, is composed of a flat ring 7, the outer diameter of which is substantially equal to the internal diameter of the fitting 6 and a disk 8 which fits against the ring, the disk and ring forming a complete closure for the air intake end of the carbureter when the valve is in closed position, as shown in Fig. 7. The ring is secured to the spindle 3, but the disk is perforated at diametrically opposite points and is adapted to slide upon studs 9 toward and from the ring. Light coiled

springs 10, surrounding these studs, normally hold the disk in engagement with the ring so as to close the air passageway when the valve is turned crosswise thereof. It will be evident that when the valve is closed, for priming purposes, and the engine is cranked, there will be a free flow of gasolene from the gasolene nozzle, and when the engine starts, the suction will cause the disk 8 to be drawn away from the ring 7, and thereby permit enough air to enter to keep the carbureter from flooding or the engine from stalling, should the operator not release the priming valve promptly. When the priming valve is released, it opens automatically by reason of the spring 2, and the springs 10 then return the disk 8 to its normal position against the ring 7, so that these two parts will form a complete closure for the air intake end of the carbureter when it is next necessary to use the priming valve. The throttle valve *t*, which regulates the quantity of mixture flowing to the engine, is cast in one piece with its stem 11 and a flange bushing 12, which parts fit into suitable openings in the upper and lower walls of the casing, and the stem is provided with an arm 13 by which the valve may be turned from the dashboard of an automobile through the usual manually operated appliances. The float chamber of the carbureter is indicated at B, and 14 represents the fitting through which the gasolene flows from the tank or source of supply to the float chamber, the level of the fuel in the latter chamber being regulated by the float 15 and a suitable valve 16, the details of which need not be described. A passageway 17 leads from the float chamber to the interior of a fuel nozzle 18, in which is fitted a manually adjustable needle valve 19, for regulating the flow of fluid through said nozzle, or entirely cutting off the flow, as desired. This nozzle projects upwardly through the lower wall of the casing 1, and upon said lower wall within the casing, is arranged a spraying or mixing nozzle *e*, with the interior of which the fuel nozzle 18 communicates. The casing 1 is preferably rectangular in cross section, as shown in Fig. 3, and the spraying or mixing device *e* comprises a head 20 which rests upon the bottom of the casing and extends across it from side to side, and a stem 21, which projects rearwardly, or toward the air intake end of the carbureter from the head. The stem 21 is bored longitudinally, as shown at 22, and this bore intersects a cross-bore or passageway 23 in the head, the ends of the latter bore being suitably closed so that the spraying or mixing device is substantially hollow, having two bores at right angles to one another. The head has a transverse series of openings 24, extending through its upper wall to the bore 23, and on its upper surface the head is grooved lengthwise of the mixing chamber in line with the perforations, as indicated at 25, and the forward end of the valve *d* normally rests upon the ribs 26, bridging over the grooves adjacent the perforations 24. These grooves form small air passageways through which the air may flow beneath the forward edge of the valve and over the orifices 24. At the rear of the cross-bore 23, and in advance of the fuel nozzle 18 is a perforation 27, extending downwardly through the upper wall of the bore 22, and a short distance at the rear of the perforation 27 is another perforation 28, these perforations being for a purpose hereinafter mentioned. The rear end of the bore 22 communicates with the interior of the casing 1, and the size of this bore may be reduced, as desired, by means of suitable bushings, one of which is shown at 29. The valve or damper *d* has on its underside an arm or bracket 30, provided with a tubular trunnion 31, which extends across the casing and is sleeved upon a pin 32, secured in the sides of the casing and extending transversely through it. A projection 33 on the spraying device serves as a rest for the bracket or arm of the damper, and as the damper is made of sheet metal stampings, this stop forms a substantial support for the valve to relieve it of strain in case of backfiring through the carbureter. The valve *d* is normally pressed to its seat by a helical spring 33^a, one end of which fits over a conical projection 34 secured to the top of the valve, while the other end fits within a cap 35, which is adjustable within a threaded opening 36 in the upper wall of the carbureter. By turning the cap 35, the tension on the spring may be varied as desired, and in order to hold the bushing frictionally in its adjusted position, a spring 37 is provided in a housing 38, and normally forces a ball or other solid object against the threads of the bushing 35. An adjusting screw 40 is fitted into the end of the housing for the purpose of applying suitable tension to the spring 37.

In operation, the draft controlled valve *d* substantially closes the passageway through the casing above the spraying device, and thus restricts the flow of air through the carbureter. In the closed position of the valve, the air flowing through the casing of the carbureter must flow beneath the draft controlled valve and in proximity to the spraying device, the air, of course, flowing more rapidly through and past this device because of the closing off of the main passageway by the damper. In cranking the engine to start it, the priming valve being closed, the liquid fuel will be drawn from the nozzle 18 into and through the passageways 22 and 23, and thence outward through the transverse series of orifices 24, thence

passing into the engine with whatever air may pass through the bore 22, perforations 27 and 28, and the channels 25 beneath the draft controlled damper. When the engine starts and is running idle at its lowest speed, the draft controlled valve remains substantially closed, in which case the air continues the courses just mentioned, intimately mixing with the liquid fuel, this mixing process commencing within the device *e* and continuing as the mixture leaves the orifices 24, where it comes in contact with the air flowing through the channels 25. When the load is thrown on the engine and the throttle valve is opened wider, the draft through the mixing chamber increases and this causes the valve or damper *d* to lift to a greater or less extent, depending upon the demands of the engine. So long as the throttle valve is substantially closed, air flows downward through the orifices 27 and 28 into the interior of the mixing device *e* and mingles with the fuel spray from the nozzle 18, the suction through the openings 24 at the outlet end of the device being great enough to cause these downward drafts of air through the nozzles 27 and 28, this air mingling with the fuel within the spraying head *e* and passing out in a mixed state through the openings 24. When the engine is working and the throttle valve is opened wider, the draft controlled valve *d* opens in response to the demands of the engine, allowing a greater flow of air through the carbureter. As this valve opens, the drafts through the orifices 27 and 28 become reversed, in succession. That is, when the draft controlled damper lifts to a certain extent, more air flows over the top of the device *e* than through the passageway 22, and hence, instead of air flowing downward through the passageway 27, liquid fuel will flow out through said passageway into the passing current of air. Thus, when the flow of air is increased to a certain extent by the draft, the liquid fuel finds an additional outlet so that an increased flow of fuel is automatically supplied with an increased flow of air. With a further opening of the throttle valve and an increase in the draft through the carbureter, the valve *d* lifts still farther and the liquid fuel then flows out through the orifice 28, as well as through the orifices 27 and 24, and thus another outlet for the liquid fuel is provided, and this automatically comes into use as the draft is increased. Upon slowing down the engine, the reverse of these operations takes place, the flow of liquid fuel through the orifice 28 first ceasing, and this being followed as the valve closes, by a cessation of the fuel flow through the orifice 27, and as the draft controlled valve nears its seat, air will flow first through the opening 28 into the mixer *e*, followed by a flow of air through the orifice 27 into the mixer *e*, and it will continue to flow through these orifices into the mixer while the engine is running idle, the fuel for the engine then all passing through the orifices 24.

There are various ways in which the mixing head may be modified, giving the same results, and in Figs. 8 to 14, inclusive, I have illustrated some of these.

For instance, in Fig. 8, in the mixing device *e'*, the channels and ribs illustrated in Figs. 1 and 1^a are omitted, and the draft controlled valve *d*, shown in dotted lines, rests upon the top of the head 20^a, in which position it would close the air passageway through the carbureter, except for the flow through the stem 21 and out through the openings 24^a, which, in this instance, are in the forward sloping side 41 of the head, adjacent to the end of the valve B, but not closed by it.

In Figs. 9 and 10, another modification, e^2, is shown, in which there is but a single opening, 24^b in the forward side of the head 20^b this opening being substantially equal in area to the sum of the areas of the transverse series of openings in the previously described figures. In Figs. 9 and 10, the bore 22^a, through the stem, extends directly to the opening 24^b, as shown in dotted lines, and a transverse passageway 42 intersects the longitudinal bore 22^a at the rear of the point where the valve *d* rests upon the head 20^b. Openings 27^a and 28^a are arranged in the stem, corresponding to the openings 27 and 28 in Fig. 1, and in addition to these openings, a transverse series of perforations 43 are extended through the rear wall of the head into the passageway 42. These transverse openings, as shown in Fig. 9, are inclined forwardly and upwardly, and these, as well as the openings 27^a and 28^a are in advance of the liquid fuel nozzle 18. It will be apparent that in the operation of this device, with slight draft through the carbureter, the mixture will flow out of the opening 24^b, and air will flow into the mixing device through openings 43, 27^a and 28^a, and through the bore of the stem, until the damper lifts in response to the demands of the engine, when fuel will flow out through the openings 43 and 27^a, and also through the opening 28^a, if the draft is sufficient. The upward and forward inclination of the openings 43 causes the liquid fuel to issue somewhat in the direction of the air draft.

In Figs. 11 and 12, the head e^3 has two transverse recesses 23^a and 42^a, which are intersected by the bore 22^b, extending through the stem into the head. A transverse series of openings 24^c extend from the recesses 23^a forwardly and upwardly through the forward wall of the head, and another transverse series of openings 43^a extend through the rear wall of the head to the recess 42^a. The valve *d* extends into proximity to the

openings 24^c, and it may rest directly upon the head or slightly above it, as shown in Fig. 12. The openings 43^a are in advance of the fuel nozzle 18. In this modification, at low engine speeds, air enters through the bore 22^b in the stem and also through the perforations 43^a, and the mixture issues from the openings 24^c. At higher speeds, the valve *d* lifts and the draft through the openings 43^a is reversed, liquid fuel issuing through said openings and mingling with the air passing between the valve and the head.

In Figs. 13 and 14 is shown still another modification of the spraying head, suitable for high power engines. In these views, the head e^4 is provided with two transversely extending bores or recesses 23^b and 42^b, which are not connected with one another, and the longitudinal bore 22^c through the stem intersects the bore 42^b only. Two fuel nozzles 18 and 18^a are provided, the former entering the bore of the stem as in the previously described figures, and the latter entering the transverse bore or recess 23^b. The head is wider than those shown in the previously described figures, and it has extending through its upper wall a transverse series of openings 24^d which connect with the recess 23^b and a similar series of openings 24^e which connect with the recess 42^b. The top of the head is grooved, as shown at 25^a, these grooves extending across the top of the head and in line with the front and rear perforations therein, and the forward end of the valve *d*, when closed, rests upon the ribs adjacent the openings 24^d. In this form of spraying head, at low engine speeds, the valve remains closed, or substantially so, and there is no draft through the bore 22^c or suction applied to the nozzle 18; or at least, the suction is insufficient to carry fuel from said nozzle. Air flows, however, through the channels 25^a, under the valve and over the orifices 24^d, and the suction caused by the engine draws the liquid fuel from the nozzle 18^a, which mingles with the air as it emerges from the orifices 24^d, forming a mixture suitable in quantity and quality for operating at low speed. It will be understood that when the valve is in closed position, the small volume of air is caused to travel rapidly past the orifices 24^d, owing to the restriction of the air passageway at this point by the valve. Hence, a thorough mixture of the air and liquid fuel is insured, even at low engine speed. With the opening of the throttle valve and consequent lifting of the draft controlled valve *d*, a draft is created through the stem of the mixing device past the fuel nozzle 18, and mixed air and fuel will then flow into the transverse passageway 42^b, and thence out through the orifices 24^e into the current of air flowing over the mixing device. Air will also flow downward through the orifices 27^b and 28^b into the bore 22^c unless the throttle is opened to a considerable extent, in which case, as in the previously described figures, the draft through these orifices will be reversed, and as the draft controlled valve continues to open, liquid fuel will flow first out through the opening 27^b and then, with the continued opening movement of the valve *d*, through the opening 28^b. From what has been said, it will be seen that with this spraying head, as the draft through the carbureter increases in response to the demands of the engine, the draft controlled valve *d* moves from its closed to its wide-open position and the liquid fuel passes out through a progressively increasing number of outlets, and conversely, as the engine slows down, the valve *d* returns to its normal position and the liquid fuel is supplied to a flowing current of air through a progressively decreasing number of outlets.

The passageway in the casing in which the draft controlled damper is situated may be considered a main air passageway, while the passageway through the spraying device may be termed an auxiliary air passageway, and for the purpose of distinguishing the spraying outlets or orifices in the claims, the orifices at the outlet end of the spraying device may be considered as the main spraying orifices, while those at the rear of the outlet end may be considered as auxiliary spraying orifices.

What I claim is:

1. In a carbureter for explosive engines, the combination with a casing having a main air passageway therethrough and an auxiliary air passageway therein, the latter having a main spraying orifice and an auxiliary spraying orifice at the rear of said main orifice, of a fuel nozzle communicating with said auxiliary passageway, and a valve in the main air passageway normally checking the flow of air past said auxiliary orifice and adapted to open in response to increased draft through the casing.

2. In a carbureter for explosive engines, the combination with a casing having a main air passageway therethrough and an auxiliary air passageway therein, the latter having a main spraying orifice and a plurality of auxiliary spraying orifices at the rear of said main orifice, of a fuel nozzle communicating with said auxiliary passageway, and a valve in the main air passageway normally checking the flow of air past said auxiliary orifices and adapted to open in response to increased draft through the casing.

3. In a carbureter for explosive engines, the combination with a casing having a main air passageway therethrough and an auxiliary air passageway therein, the latter having a main spraying orifice and an auxiliary

spraying orifice at the rear of said main orifice, of a fuel nozzle communicating with said auxiliary passageway at the rear of said auxiliary orifice, and a valve normally extending across the main air passageway in advance of said auxiliary orifice and adapted to open in response to increased draft through the casing.

4. In a carbureter for explosive engines, the combination with a casing having a main air passageway therethrough and an auxiliary air passageway therein, the latter having a main spraying orifice and an auxiliary spraying orifice at the rear of said main orifice, of a fuel nozzle communicating with said auxiliary passageway at the rear of said auxiliary orifice, and a hinged draft controlled valve normally extending across the main air passageway and having its free end adjacent said main spraying orifice.

5. In a carbureter for explosive engines, the combination with a casing having a main air passageway therethrough and an auxiliary air passageway therein, the latter having a main spraying orifice and a plurality of auxiliary spraying orifices spaced rearwardly at different distances from the main orifice, of a fuel nozzle communicating with said auxiliary passageway, and a valve in the main air passageway normally checking the flow of air past said auxiliary orifices and adapted to open in response to increased draft through the casing.

6. In a carbureter for explosive engines, the combination with a casing having a main air passageway therethrough and an auxiliary air passageway therein, the latter having a series of main spraying orifices extending transversely of the casing at its forward end and an auxiliary spraying orifice at the rear of said series, of a fuel nozzle communicating with said auxiliary passageway and a valve in the main air passageway normally checking the flow of air past said auxiliary orifice and adapted to open in response to increased draft through the casing.

7. In a carbureter for explosive engines, the combination with a casing having a main air passageway therethrough and an auxiliary air passageway therein, the latter having a series of main spraying orifices extending transversely of the casing at its forward end and a transverse series of auxiliary spraying orifices at the rear of said main series, of a fuel nozzle communicating with said auxiliary passageway, and a valve in the main passageway normally checking the flow of air past said auxiliary orifices and adapted to open in response to increased draft through the casing.

8. In a carbureter for explosive engines, a casing having a main air passageway therethrough, a spraying device within the casing comprising a hollow head extending transversely of the casing, and having a transverse series of spraying openings, and a tubular stem communicating with said head, a liquid fuel nozzle communicating with the interior of said stem, and a draft-controlled valve normally restricting the flow of air through said passageway.

9. In a carbureter for explosive engines, a casing having a main air passageway therethrough, a spraying device within the casing comprising a hollow head extending transversely of the casing, and having a transverse series of spraying openings, and a tubular stem communicating with said head, a liquid fuel nozzle communicating with the interior of said stem, and a hinged draft controlled valve normally extending across said passageway and having its free end adjacent said openings.

10. In a carbureter for explosive engines, a casing having a main air passageway therethrough, a spraying device within the casing comprising a hollow head extending transversely of the casing, and having a transverse series of spraying openings, and a tubular stem communicating with said head, the latter having one or more spraying openings therein, a liquid fuel nozzle communicating with said stem, and a draft controlled valve normally extending across said passageway in advance of the openings in the spraying stem.

11. In a carbureter for explosive engines, a casing having a main air passageway therethrough, a spraying device within the casing comprising a hollow head extending transversely of the casing, and having a transverse series of spraying openings extending through its upper wall and ribs or projections on said wall between the openings, and a tubular stem communicating with said head, a liquid fuel nozzle communicating with the interior of said stem, and a hinged draft-controlled valve normally extending across the passageway and having its free end adjacent said ribs.

12. In a carbureter for explosive engines, the combination with a casing having a main air passageway therethrough of a spraying device within the casing comprising a hollow head extending transversely of the casing and a tubular stem projecting rearwardly from the head, the head having a spraying orifice and the stem having a bushing in its inlet end, a fuel nozzle communicating with said stem in advance of the bushing, and a draft-controlled valve extending across said passageway adjacent said head.

13. In a carbureter for explosive engines, the combination with a casing having a main air passageway therethrough of a head extending transversely of the casing and having two disconnected transverse bores, one in front of the other, and two series of spraying orifices, one extending from each

bore, an auxiliary air passageway communicating with the rear bore, fuel nozzles communicating with both bores, and a hinged draft-controlled valve for the main air passageway having its free end normally adjacent the outlet orifices of the forward bore.

In testimony whereof I have affixed my signature, in presence of two witnesses.

RALPH SHIPMAN.

Witnesses:
P. M. SAVIDGE,
WALLACE E. KLOPP.